According to the exemplary embodiments of the present invention, by configuring at least one of a plurality of radiation sources as a dual-purpose radiation source, a radiation generation apparatus having a smaller size can be manufactured. In addition, since the dual-purpose radiation source is arranged at a position where the dual-purpose radiation source can be used for both non-tomosynthesis imaging and tomosynthesis imaging, tomosynthesis imaging and non-tomosynthesis imaging can be performed continually without changing the positions of the radiation sources.

Generally, the total radiation dose in tomosynthesis imaging is approximately equal to that in non-tomosynthesis imaging. Thus, for example, when a single dual-purpose radiation source is used, the radiation dose emitted from this dual-purpose radiation source during non-tomosynthesis imaging is at least ten times to several tens of times that emitted from a single radiation source during tomosynthesis imaging. As a result, in non-tomosynthesis imaging, more imaging time is required for obtaining necessary radiation dose.

According to the exemplary embodiments of the present invention, the electron irradiated surface of the target unit of the dual-purpose radiation source is configured to experience a smaller temperature increase than that experienced by each of the target units of the single-purpose radiation sources that only emit radiation for tomosynthesis imaging, when electrons are irradiated under the same conditions. In this way, a larger current amount can be supplied to the target unit of the dual-purpose radiation source during non-tomosynthesis imaging and the generated radiation dose can be increased. As a result, the imaging time can be shortened.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2013-035612 filed Feb. 26, 2013, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. A multiradiation generation apparatus comprising:

a plurality of radiation sources arranged in a row,

wherein at least one of the plurality of radiation sources is a dual-purpose radiation source and the remaining plurality of radiation sources are single-purpose radiation sources,

wherein the dual-purpose radiation source is used for both tomosynthesis imaging and non-tomosynthesis imaging, and the single-purpose radiation sources are used only for tomosynthesis imaging

wherein each of the plurality of radiation sources includes an electron source configured to emit electrons and a target unit configured to generate radiation upon receiving electrons emitted from the electron source,

wherein each of the plurality of radiation sources further includes a shield arranged around the corresponding target unit,

wherein the shield has a passage hole and an emission hole, and

wherein the passage hole or the emission hole of the shield of the dual-purpose radiation source has a smaller diameter at a place where the passage hole or the emission hole is in contact with the target unit than that of each of the passage holes or the emission holes of the shields of the single-purpose radiation sources.

2. The multiradiation generation apparatus according to claim **1**, wherein, when electrons are irradiated under the same conditions, an electron irradiated surface of the target unit of the dual-purpose radiation source is configured to have a smaller temperature increase than that of each of the target units of the single-purpose radiation sources.

3. The multiradiation generation apparatus according to claim **2**, wherein the target unit of the dual-purpose radiation source has higher heat release properties than those of each of the target units of the single-purpose radiation sources.

4. The multiradiation generation apparatus according to claim **2**,

wherein the target unit includes a substrate and a target layer which is formed on a side of the substrate on the side facing the electron source, and

wherein the substrate of the target unit of the dual-purpose radiation source is thicker than the substrate of each of the target units of the single-purpose radiation sources.

5. The multiradiation generation apparatus according to claim **2**,

wherein the target unit includes a substrate and a target layer which is formed on a side of the substrate on the side facing the electron source, and

wherein the substrate of the target unit of the dual-purpose radiation source has a larger diameter than that of each of the substrates of the target units of the single-purpose radiation sources.

6. The multiradiation generation apparatus according to claim **2**,

wherein the target unit of the dual-purpose radiation source is arranged with an inclination with respect to a direction in which the electrons are caused to be incident, and

wherein each of the target units of the single-purpose radiation sources is arranged perpendicularly with respect to the direction in which the electrons are caused to be incident.

7. The multiradiation generation apparatus according to claim **1**,

wherein the passage hole of the shield is arranged on the side of the electron source and passes the electrons, and

wherein the emission hole of the shield is arranged on the opposite side of the electron source and allows emission of radiation generated by the target unit to a predetermined region.

8. The multiradiation generation apparatus according to claim **7**, wherein the shield of the dual-purpose radiation source is thicker than each of the shields of the single-purpose radiation sources in a direction perpendicular to the row of the target units and a direction in which the electrons are caused to be incident.

9. The multiradiation generation apparatus according to claim **7**, wherein a heat-release fin is connected to the shield of the dual-purpose radiation source.

10. The multiradiation generation apparatus according to claim **7**, wherein the shields of the radiation sources are integrally formed.

11. A radiation imaging system comprising:

the multiradiation generation apparatus according to claim **1**;

a radiation detection apparatus configured to detect radiation that has been emitted from the multiradiation generation apparatus and has passed through an object; and

a system control apparatus configured to perform cooperation control over the radiation generation apparatus and the radiation detection apparatus.